Remarks

Reconsideration and allowance of the subject patent application are respectfully requested.

Claims 1, 5-7, 10, 17, 18, 21-26, 28 and 31-35 were rejected under 35 U.S.C. Section 103(a) as allegedly being "obvious" over Maitani et al. (U.S. Patent No. 6,656,828) in view of Ianuzzi et al. (U.S. Patent No. 4,176,443).

Claim 1 describes that the metal layer which completely covers a bottom surface, but not side surfaces, of an opening section on a main conductor layer includes a nickel layer and a gold layer. The nickel layer is made of Ni or a metal having Ni as its main component, by electroless plating. Claim 17 describes that the metal layer which completely covers the upper surface portion of a wiring layer exposed by an opening in an insulating layer comprises a barrier metal layer and a top layer. Claim 25 describes that the metal layer which completely covers the upper surface of a wiring layer exposed by an opening comprises a barrier metal layer and a top layer. Each of the claims 17 and 25 further specifies that the barrier metal layer is formed only in the opening in the insulating layer. Claim 35 describes that the metal layer having its lateral dimensions defined by an opening in the insulating layer comprises a barrier metal layer and a top layer. The metal layer completely covers an upper surface portion of a wiring layer exposed by the opening, but does not completely cover side surfaces of the opening.

For the reasons set forth below, Applicants traverse the rejection of these claims, and the claims that depend therefrom, as allegedly being obvious over the proposed combination of Maitani et al. and Ianuzzi et al.

Figure 5 of Maitani et al. discloses forming a gold layer 15 in an opening formed in polyimide layer 3. As acknowledged in the office action, there is no disclosure or suggestion that, among other things, Ni layer 14 of Maitani et al. be formed only in the opening. See page 3 of 6/29/05 Office Action ("Fig. 5 of Maitani shows most aspect (sic) of the instant invention except a Ni layer (barrier layer) formed only in the opening."). The office action relies upon Ianuzzi et al. to cure this deficiency.

Ianuzzi et al. contains two references to an Ni layer. At col. 2, lines 35-36, Ianuzzi et al. mentions "...a second intermediate layer 4 of nickel with a minimum thickness of 4000 Å ..." Col. 3, lines 20-27 of Ianuzzi et al. describes:

> This operation is followed by successive vapor depositions over the entire front surface, under vacuum at temperatures between 100° and 150° C, of Cr and Ti to formed the layers 3, of Ni to form the layers 4, and of Au or Pd to form the layers 5. The remaining parts of the photoresist layer 16, indicated by phantom lines, can then be stripped off together with the portions of layers 3, 4, and 5 deposited thereon.

Consequently, the Ni layer 4 (second intermediate layer) of Ianuzzi et al. is formed by vapor deposition, not electroless plating. As such, Ianuzzi et al. clearly does not contain the technical idea that the Ni layer 4 is formed by electroless plating as specified, for example, in claim 1.

Further, the Ni layer 4 of Ianuzzi et al. is laminated on a "first intermediate layer 3" made of Cr or Ti. The Cr or Ti layer is laminated on the base layer 2 made of Al, and the Al layer is laminated on the emitter region or the base region made of Si. This arrangement differs significantly from that of Maitani et al. in which, for example, Ni layer 14 is formed over the entire surface of a Cu layer 6. Still further, Ianuzzi et al. does not attach any particular significance to forming an Ni layer only within the opening section.

In summary, Ianuzzi et al. is different from the pending claims and from Maitani et al. in its technical idea and at best suggests an arrangement in which an Ni layer formed by deposition is provided in a region at least including an opening section on a metallic layer which is not made of Cu.

The office action states that the basis for modifying Maitani et al. based on Ianuzzi et al. is to "reduce the packaging size". However, there is no evidence identified in the office action that a reduced packaging size would result from the proposed combination and Applicants respectfully submit that one of ordinary skill in the art would not have looked to Ianuzzi et al. to reduce packaging size as proposed. In addition, the office action does not explain what would motivate one of ordinary skill to modify Maitani et al., which already includes an Ni layer 14, to provide another Ni layer such as Ni layer 4 of Ianuzzi et al.

Further, Applicants respectfully submit that it would not have been obvious to simply combine Maitani et al. and Ianuzzi et al. to arrive at the subject matter of the pending claims because of the differences in the technical ideas and basic arrangements described in these documents. The office action treats Maitani et al. and Ianuzzi et al. with an improper hindsight view to construct the features of the claims. Thus, the office action generally views the Ni layers, the Cu layer and the Au layer in the applied documents without taking into consideration the context in which these layers are formed and arranged in the respective documents. In the proposed combination, the office action fails to take into account, for example a material of the layer on which the Ni layer is laminated and the step of forming the Ni layer.

Specifically, the method of Maitani et al. for manufacturing a semiconductor device and the method of Ianuzzi et al. for manufacturing a semiconductor device are differ from each other at least with respect to the step of forming the Ni layer. Consequently, even assuming for the sake of argument that a person of ordinary skill were for some reason to recognize that the Ni layer 4 of Ianuzzi et al. is provided on an area including an opening section and attempted to try to form the Ni layer 14 of Maitani et al. only on the opening section as alleged in the office action, the inconsistency in forming steps between Maitnai et al. and Ianuzzi et al. would make it difficult to achieve this desired result. That is, the manner of forming Ni layer 14 in Maitani et al. does not allow this layer 14 to be formed to cover a bottom surface, but not side surfaces, of an opening section as in claim1 or to be formed only in an opening section as in claims 17 and 25 or to be formed to completely cover the upper surface of a wiring layer exposed by an opening, but not to completely cover the side surfaces of the opening as in claim 35.

Moreover, according to the combination of Maitani et al. and Ianuzzi et al. proposed in the office action, the Ni layer 14 (barrier layer) formed by electroless plating would be laminated on an entire surface of the Cu layer 6 as in Maitani et al. An Ni layer and an Au layer would then allegedly be provided by vapor deposition on the pad 6P, presumably after providing an aluminum layer, as taught by Ianuzzi et al. The bump electrode would be formed thereafter. However, in this combination, the Ni layer in the opening would not formed by electroless plating as specified, for example, in claim 1.

Further, if the proposed combination is argued to involve replacing the Ni layer 14 of Maitani et al. with the Ni layer of Ianuzzi et al., the Ni layer formed on the opening section would still not be formed by electroless plating as specified, for example, in claim 1.

Consequently, the proposed combination of Maitani et al. and Ianuzzi et al. cannot result in an arrangement in which, for example, an Ni layer formed by electroless plating and an Au layer are laminated only on the Cu layer 5 exposed by an opening section and the protrudent electrode 9 is formed thereon.

For at least these reasons, Applicants submit that the proposed combination of Maitani et al. and Ianuzzi et al. would not have resulted in the subject matter of the rejected claims.

Claim 19 was rejected under 35 U.S.C. Section 103(a) as allegedly being "obvious" over the proposed Maitani et al.-Ianuzzi et al. combination, in further view of Greer (U.S. Patent No. 6,451,681). However, as previously discussed, this purported "conductive layer" of Greer is, among other things, not connected to an electrode pad formed on a semiconductor substrate as claimed. As such, Greer would not have provided any teaching or suggestion to modify the conductive layer of the combined Maitani et al.-Ianuzzi et al. combination as proposed.

New claims 36-38 have been added. The subject matter of these new claims is fully supported by the original disclosure and no new matter is added.

Claims 36-38 respectively depend from claims 17, 25 and 35 and are believed to be allowable because of this dependency and because of the additional patentable features recited therein.

Applicants submit that the pending claims are in condition for allowance, and action to that end is earnestly solicited.

If any issues remain to be resolved, the Examiner is urged to contact the attorney for Applicants at the telephone number listed below.

Respectfully submitted,

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